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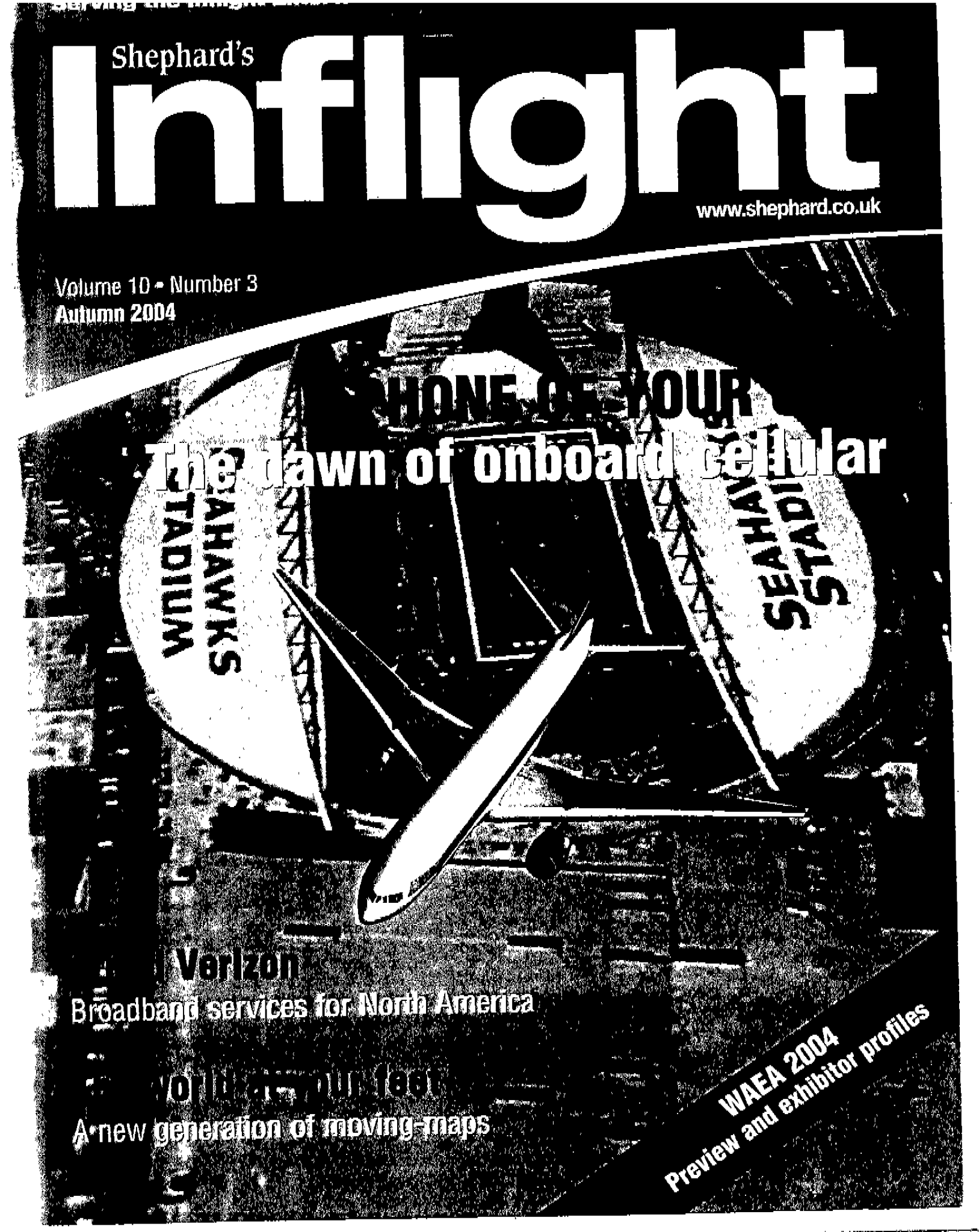


The dawn of onboard cellular

Verizon
Broadband services for North America

A new generation of moving-maps

WAEA 2004
Preview and exhibitor profiles

FEATURES

Making the Connexion

The first Lufthansa A340-600 to be fitted with Connexion

Behind the razzmatazz of the world's first airline inflight Internet service lies a story of engineering professionalism. BRENDAN GALLAGHER describes the Lufthansa Technik approach to installing Connexion by Boeing and developing a new service offering of its own

THIS summer launch customer Lufthansa introduced Connexion by Boeing-based Internet access on its second route, Munich-Tokyo. Soon afterwards, sister company Lufthansa Technik announced that it had won its first contract outside the Lufthansa Group for Connexion installations. It came from SAS, which also plans to offer satellite broadband and wireless access to its passengers.

As the Connexion customer list grows, the SAS job could be the first of many for the versatile Hamburg-based company. It covers installation of the top-mounted mechanically steered antenna, a router, WiFi wireless access points and other system components on the Scandinavian carrier's four Airbus A330-300s and seven A340-300s.

"We are also negotiating contracts with another couple of airlines," says Lufthansa Technik engineering services director Ulf Hallmann. "And we're talking to Airbus about fitting Connexion to new aircraft on the line."

Lufthansa Technik's involvement with Connexion dates back to the beginning of the decade, when Lufthansa set out to be the first airline in the world to offer airborne Internet access to its passengers. With its experience of installing a Boeing Systems-developed satellite broadband antenna to support inflight television in a VIP A340, Lufthansa Technik was the obvious choice as engineering lead.

The company was responsible for the Boeing 747-400 installation that Lufthansa used to publicise its Internet plans in the first quarter of last year. The fit comprised a pair of prototype phased-array antennas from Boeing Systems and, inside the cabin, a router, nine switches and five wireless access points from Cisco Systems. The latter were all standard Cisco designs, modified and certificated for airborne use by Lufthansa Technik. The wireless local-area network, giving WiFi-capable laptops access to the Connexion system, was the first in the world to be cleared for air transport use.

Installation service bulletin and kit

IN May of this year Lufthansa Technik was contracted to install Connexion in Lufthansa's entire long-haul fleet, totalling 78 Airbus A330s and A340s and Boeing 747-400s, by spring 2006. It was also commissioned to develop an installation service bulletin and kit for the A330-300 and A340-300 and -600 that Connexion will offer to carriers signing up for the service. The company is ready to develop similar provision for other A330 and A340 variants on request.

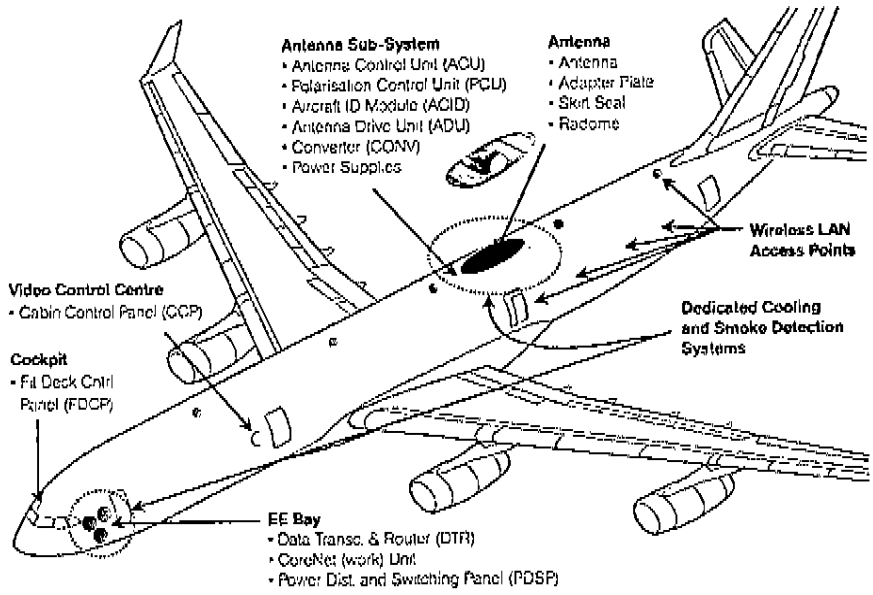
Installations on Lufthansa's A340-300s and -600s are now in full swing, with work on the first A330-300 due to start next month. Development of the A340 installation presented the Hamburg engineers with a number of challenges, according to Hallmann. "Working closely with Airbus, we had to position the antenna carefully to minimise any effect on the aircraft's flight performance and to rule out interference with possible future airframe modifica-


Antenna, adapter plate and cabling installed on a Lufthansa A340-300

tions," he explains. "And to maximise system performance we had to ensure that all antenna subsystem LRUs were located as close as possible to the antenna itself."

Other design objectives included minimal operational demands on the flight-deck and cabin crew, and enhanced maintainability through such things as guaranteed easy access to system line-replaceable units (LRUs) and inspection routines and intervals compatible with standard practices for the rest of the airframe.

The company's efforts have so far yielded A340-300 and -600 supplemental type certificates (STCs) from German airworthiness authority LBA and the European Aviation Safety Agency. FAA STCs have been applied for and approvals for the A330-300 are in the pipeline.



Plan of the Connexion installation on the A340-300 shows the location of the principal elements – the antenna subsystem and the data transceiver and router (DTR)

Preparing the ground at SAS

BEFORE the award of the SAS contract a team from Hamburg inspected some of the carrier's A330s and A340s on the ground at their Copenhagen base to ensure the full compatibility of the planned installation. Once work starts, Lufthansa Technik representatives will be on hand at all times to lend support as the airline's own engineers apply the installation kit to each aircraft. Time to complete each fit is put at a maximum of ten days, assuming experienced teams working three shifts a day.

The Connexion installation destined for the SAS aircraft will be similar to that now flying in Lufthansa's A340-300s. A brief listing of the various systems elements gives an idea of the scale of the engineering effort involved.

Mounted on the aircraft spine is the antenna itself – a single Mitsubishi Electric mechanically steered unit is now standard – and its associated adapter plate, radome and skirt seal. Just below, inside the aircraft pressure vessel, is the antenna subsystem: control unit, polarisation control unit, aircraft identification module, drive unit, converter and power supplies. The subsystem has its own dedicated cooling and smoke-detection.

In the electronics bay near the flight deck is the heart of the onboard Connexion by Boeing system, the data transceiver and router, and the power distribution and switching panel.

The remaining units provide for system interaction by passengers and cabin and flight crew. WiFi-capable passenger laptops communicate with five wireless LAN access points distributed throughout the cabin, themselves communicating with the CBB system through the Ethernet gateway unit (EGU). The EGU is the hub of the overall aircraft LAN, which also includes the Rockwell Collins cTES inflight entertainment system, a terminal wireless LAN unit for use with airport wireless networks, and the server interface unit, which pro-

WALKING THE BROADBAND TALK

ONE of the first Connexion-equipped flights by Lufthansa on its Munich-Tokyo route this July showed what increasing numbers of travellers have to look forward to as the service becomes more widely available. Learning from past airline inflight communications failures, Lufthansa is promoting the new offering very effectively.

At the gate in Munich Lufthansa staff distributed a booklet introducing the airline's Connexion-based FlyNet service and explaining how to set up a WiFi-capable laptop to access it. Aboard the aircraft, a page of the cabin services booklet was devoted to FlyNet, as was an article in the inflight magazine. Bulkhead stickers proclaimed "Wireless LAN zone".

After take-off, there were announcements by the purser in German, English and Japanese, followed by a video promoting the service and explaining how to register with Connexion by Boeing: passengers can subscribe in advance through the Connexion Website or via the free FlyNet Lufthansa information portal once airborne.

On powering up his wireless laptop, the passenger has only to open a standard browser, which defaults automatically to the FlyNet portal (this is also available free to non-subscribers), and click on the Connexion icon to go to the sign-up area. The sign-up process takes the passenger through four screens – pricing details, user information and credit-card details, a consent form, and user name and password set-up – and can be completed in minutes.

Connexion plans to serve no more than 20 aircraft simultaneously per satellite transponder. Assuming the maximum advertised downlink capacity of 20 Mbit/sec, each aircraft would have 1 Mbit/sec to be shared among all its simultaneous users. On Munich-Tokyo-Munich *Inflight* experienced a very robust link that was available continuously for several hours and which compared well in speed with an office LAN on the ground.

Lufthansa introduced FlyNet commercially for the first time in mid-May, on Munich-Los Angeles, and extended it to Munich-Tokyo at the end of June. Usage in the last two weeks of May – when access to the service was free, compared with the standard tariff of $29.95 per sector – averaged 10-15 passengers per flight. Charging began on 1 June.

Finishing touch: the Connexion radome is placed over the antenna and adapter plate

vides access to aircraft avionics data.

A panel next to the standard aircraft video control centre allows cabin crew to switch on and off the Connexion system, the wireless LAN and the wired aircraft LAN, and provides system status indications. The flight deck control panel provides a master shut-off, and smoke and system failure indications.

As Connexion by Boeing signs up early customers it is evident that a key locus for its business will lie in Asia-Pacific. Lufthansa Technik is keen to accommodate that demand and is preparing to supplement the Hamburg operation by offering installations at its Manila A330/A340 support facility in the Philippines.

CATCH UP WITH CONNEXION

AS well as Lufthansa and SAS, Connexion by Boeing has definitive service agreements with ANA, Japan Airlines and Kingdom Holding Company of Saudi Arabia. It also holds letters of intent (LOI) from Asiana, China Airlines, Korean Air and Singapore Airlines.

Other installation programmes include those of ANA and Asiana. The first of six new Boeing 777-300ERs for ANA will be equipped at Boeing's Everett, Washington State, facility this autumn. The LOI with Asiana calls for new 777-200ERs due for delivery next July to be fitted with Connexion.

The company has WiFi distribution agreements with associate service providers Infonet and iPass (USA), NTT DoCoMo (Japan), Starhub (Singapore) and T-Systems (Germany).

Connexion's geographical coverage currently extends from the west coast of the USA, across the Atlantic, Europe and Asia to the Pacific beyond Japan, almost entirely in the northern hemisphere. Depending on demand, the company is aiming to achieve worldwide coverage within 78 degrees north and south by 2006.

Connexion is claiming a current potential market of 300,000 business users via agreements with a number of corporations, including Siemens of Germany.

Work is under way to develop an onboard cellular capability for integration with the satellite service as early as the end of next year.

The company is also addressing the business aircraft market through eXchange, the service that it is marketing through Rockwell Collins. eXchange will combine the Ku-band connectivity and ground network put together by Connexion for the airlines with the antenna technology and signal processing of Collins' Tailwind inflight direct-broadcast TV system for business and VIP aircraft.

The service is aimed at aircraft of super-midsize and above. It will debut aboard the Bombardier Global family, with installations due to begin this year and certification and service launch set for early 2005.